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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/090,747	03/06/2002	Minoru Onodera	220362US0	5245
22850	7590	07/06/2004	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			GOFF II, JOHN L.	
			ART UNIT	PAPER NUMBER
			1733	

DATE MAILED: 07/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/090,747	Applicant(s) ONODERA ET AL.	
	Examiner John L. Goff	Art Unit 1733	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 April 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This action is in response to the amendment received on 4/28/04. The previous rejections over Saito et al. (EP 507332) and Onodera et al. (U.S. Patent 5,843,562) are withdrawn in view of applicants amendment.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
4. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (U.S. Patent 5,360,672) in view of either one of Kinose et al. (U.S. Patent 5,028,457) or Kumazawa (U.S. Patent 3,947,296).

Saito et al. disclose a process for forming a printed circuit board comprising contacting a liquid crystal polymer (LCP) film capable of forming an optically anisotropic melt phase and a metal foil followed by bonding the layers together (Column 8, lines 13-20). Saito et al. teach

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prior to contacting the LCP film and the metal foil the LCP film undergoes a heat treatment by passing through nip rolls heated in the range of from 80 °C below the melting point of the LCP film to 5 °C below the melting point, the heat treatment performed to increase the abrasion resistance of the LCP film (Column 6, lines 30-60). Saito et al. disclose the heat treatment is performed such that the LCP film does not flow and there occurs no substantial difference in the film thickness before and after the treatment such that it is clear Saito et al. do not transfer any unevenness pattern to the LCP film during heat treatment (Column 6, lines 49-55 and Column 7, lines 17-21). However, regarding the limitation requiring “a heat treatment roll having unevenness on a surface” it is noted that while the heat treatment rolls taught by Saito et al. do not transfer an unevenness pattern the heat treatment rolls taught by Saito et al. would have some unevenness as smooth rolls have some degree of surface roughness as shown for example by Kinose et al. or Kumazawa. Kinose et al. disclose a roll (e.g. used for pressing) having a smooth surface as opposed to a grooved surface wherein a smooth surface requires a surface roughness less than 15 microns (Column 3, lines 14-23 and Column 6, lines 54-59). Kumazawa discloses that conventional, i.e. ordinary, smooth rolls have a surface roughness of several microns (Column 2, lines 56-59). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the heat treatment rolls taught by Saito et al. would have some surface roughness, i.e. unevenness, of for example 15 microns or less as it was well known in the art that smooth rolls intrinsically have some surface roughness as shown for example by either one of Kinose et al. or Kumazawa.

Regarding claims 2 and 6, Saito et al. are silent as to the thermal dimensional change at 200 °C of the LCP film and the temperature of the heat treatment roll within 30 °C of the thermal

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deflection temperature of the LCP film. However, the LCP films suggested by Saito et al. (Column 2, line 30 through Column 6, line 14) are the same those claimed and they are consistent and in agreement with applicants specification (See page 8, line 8 through page 12, line 3 of the specification), and the heat treatment suggested by Saito et al. (Column 6, lines 30-34 and the Examples) is performed over the same temperature range as that disclosed by applicant (See the Examples of the specification) such that it appears the LCP films and the heat treatment of the films suggested by Saito et al. would satisfy the claimed limitations. In any event regarding the heat treatment temperature, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine/optimize the particulars of the heat treatment, e.g. temperature, as a function of the abrasion resistance of the LCP film as doing so would have required nothing more than ordinary skill and routine experimentation.

Regarding claim 4, Saito et al. teach operating the press rolls at pressures as low as 20 kg/cm such that the limitation requiring substantially no pressure is met.

5. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. and either one of Kinose et al. or Kumazawa as applied to claims 1, 2, and 4-6 above, and further in view of the admitted prior art (Specification pages 1-3).

Saito et al. and either one of Kinose et al. or Kumazawa as applied above teach all of the limitations in claim 3 except for a specific teaching of thermocompression bonding the LCP film to the metal foil, it being noted Saito et al. teach bonding the LCP film and metal foil together with the optional use of adhesive. It would have been obvious to one of ordinary skill in the art at the time the invention was made to bond the LCP film and metal foil as taught by Saito et al. as modified by either one of Kinose et al. or Kumazawa using a thermocompression bonding

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technique as opposed to the use of adhesives as it was well known and conventional in the art to bond an LCP film and metal foil in this manner as shown for example by the admitted prior art wherein the use of adhesives is avoided.

The admitted prior art discloses a known process from EP 0507332 A2 comprising contacting at least one liquid crystal polymer (LCP) film capable of forming an optically anisotropic melt phase and at least one metal foil and then pressing the contacted layers by passing them through a nip between press rolls at a temperature in the range from 80 °C below the melting point of the LCP to 5 °C below the melting point to form laminates including printed circuit boards (PCBs) with it being noted EP 0507332 A2 is not limited to any particular LCP film and EP 0507332 A2 is silent as to the dimensional stability of the LCP film (Page 3, lines 2-24 of applicants specification and Page 2, lines 1-2 and Page 3, lines 4-8 and 25-26 of EP 0507332 A2).

6. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (Specification pages 1-3) in view of Itoyama et al. (U.S. Patent 4,798,875) and either one of Kinose et al. (U.S. Patent 5,028,457) or Kumazawa (U.S. Patent 3,947,296).

The admitted prior art discloses a known process from EP 0507332 A2 comprising contacting at least one liquid crystal polymer (LCP) film capable of forming an optically anisotropic melt phase and at least one metal foil and then pressing the contacted layers by passing them through a nip between press rolls at a temperature in the range from 80 °C below the melting point of the LCP to 5 °C below the melting point to form laminates including printed circuit boards (PCBs) with it being noted EP 0507332 A2 is not limited to any particular LCP film and EP 0507332 A2 is silent as to the dimensional stability of the LCP film (Page 3, lines 2-

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24 of applicants specification and Page 2, lines 1-2 and Page 3, lines 4-8 and 25-26 of EP 0507332 A2). Itoyama et al. disclose an LCP film capable of forming an optically anisotropic melt phase having excellent dimensional stability useful in the formation of PCBs wherein the film undergoes a heat treatment in an oven or on a roll according to known procedures at temperatures of 180 to 240 °C (Column 1, lines 6-11 and Column 14, lines 30-36). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use as the LCP film taught by the admitted prior art the LCP film taught by Itoyama et al. for its excellent dimensional stability.

Regarding claim 1, it is noted the heat treatment disclosed by Itoyama et al. may be performed in an oven (or alternatively on a roll) such that it is clear Itoyama et al. does not transfer any unevenness pattern to the LCP film during heat treatment. However, regarding claims 1 and 6 and the limitation requiring "a heat treatment roll having unevenness on a surface" it is noted that while the heat treatment roll taught by Itoyama et al. does not transfer an unevenness pattern the heat treatment roll taught by Itoyama et al. would have some unevenness as smooth rolls intrinsically have some surface roughness as shown for example by Kinose et al. or Kumazawa. Kinose et al. disclose a roll (e.g. used for pressing) having a smooth surface as opposed to a grooved surface wherein a smooth surface requires a surface roughness less than 15 microns (Column 3, lines 14-23 and Column 6, lines 54-59). Kumazawa discloses that conventional, i.e. ordinary, smooth rolls have a surface roughness of several microns (Column 2, lines 56-59). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the heat treatment roll taught by the admitted prior art as modified by Itoyama et al. would have some surface roughness, i.e. unevenness, of for example 15 microns or

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less as it was well known in the art that smooth rolls intrinsically have some surface roughness as shown for example by either one of Kinose et al. or Kumazawa.

Regarding claims 2 and 6, the admitted prior art and Itoyama et al. are silent as to the thermal dimensional change at 200 °C of the LCP film and the temperature of the heat treatment roll within 30 °C of the thermal deflection temperature of the LCP film. However, the LCP films suggested by Itoyama et al. (Column 1, line 50 through Column 13, line 29) having excellent dimensional stability are of the same type as those disclosed by applicant (See page 8, line 8 through page 12, line 3 of the specification), and the heat treatment suggested by Itoyama et al. (Column 14, lines 30-36) is performed over the same temperature range as that disclosed by applicant (See the Examples of the specification) such that it appears the LCP films and the heat treatment of the films suggested by the admitted prior art as modified by Itoyama et al. would satisfy the claimed limitations. In any event regarding the heat treatment temperature, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine/optimize the particulars of the heat treatment, e.g. temperature, as a function of the dimensional stability of the LCP film as doing so would have required nothing more than ordinary skill and routine experimentation.

Regarding claim 4, the admitted prior art as modified by Itoyama et al. teach passing the LCP film over a (single) heat treatment roll. It is noted in a single treatment roll application there is no external application of pressure (as exemplified by Figure 2 and Column 5, lines 22-59 of Shigemoto et al. (U.S. Patent 4,880,589)).

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Response to Arguments

7. Applicant's arguments with respect to claims 1-6 have been considered but are moot in view of the new ground(s) of rejection. As noted above, the previous rejections over Saito et al. (EP 507332) and Onodera et al. (U.S. Patent 5,843,562) are withdrawn in view of applicants amendment.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **John L. Goff** whose telephone number is **(571) 272-1216**. The examiner can normally be reached on M-F (7:15 AM - 3:45 PM).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Blaine Copenheaver can be reached on (571) 272-1156. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



John L. Goff



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